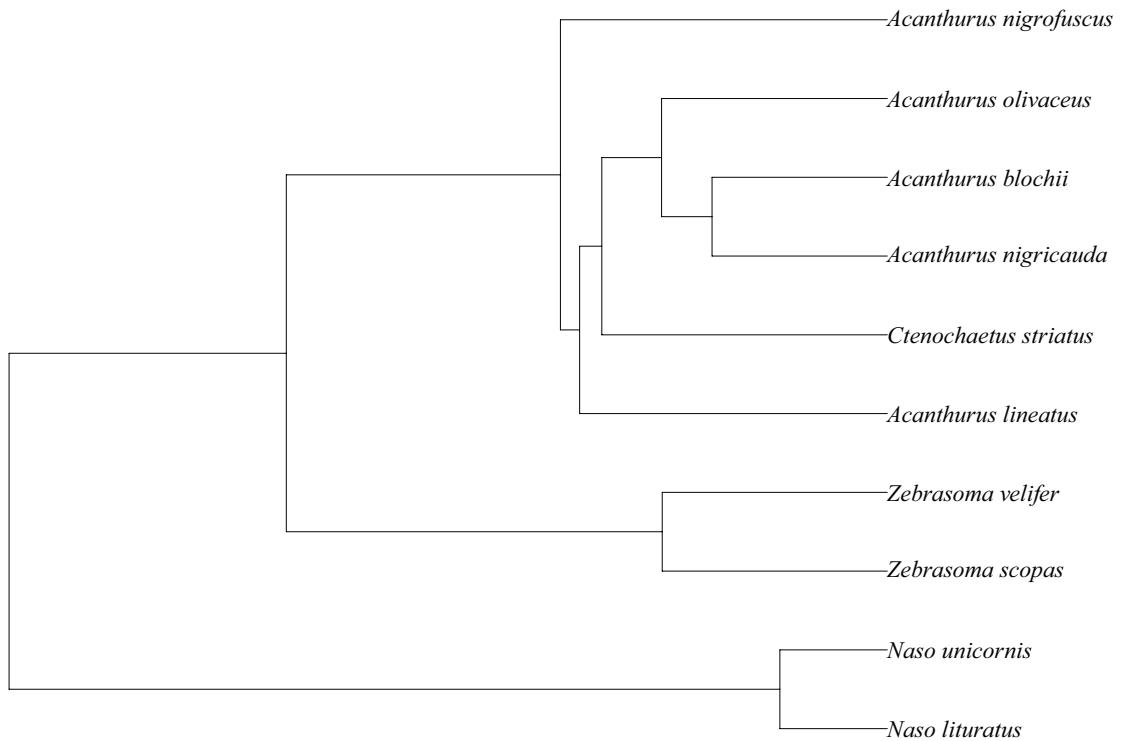


ESM 1: (a) List of morphological traits measured and their ecological significance.
All measurements are explained in greater detail in Bellwood et al. 2014 and references therein.

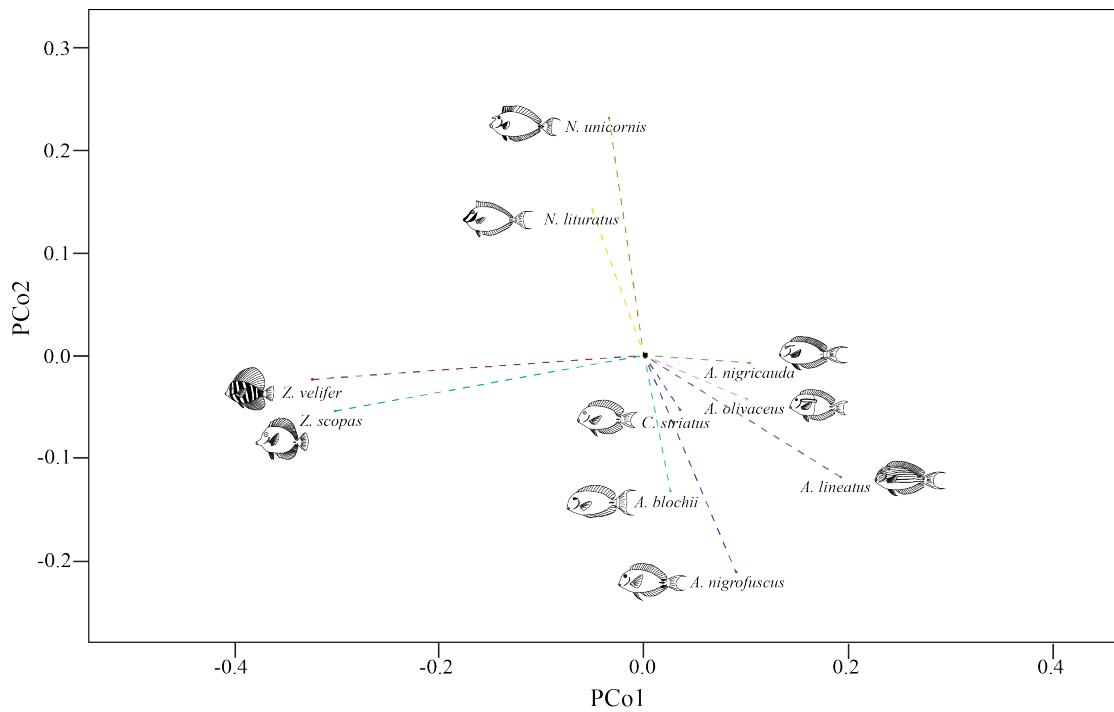
Morphological trait	Measured as	Affects
Body depth	Body depth/standard length	Predator avoidance, manoeuvrability
Head length	Head length/standard length	Sensory and trophic capabilities
Narrowest point on caudal peduncle	Width caudal peduncle/body depth	Swimming speed
Body aspect ratio	Body depth ² /body area	Predator avoidance, manoeuvrability
Medial caudal fin ray length	Medial fin ray/longest fin ray	Swimming ability and speed
Snout length	Snout length/head length	Precision in prey acquisition
Eye diameter	Eye diameter/head length	Visual acuity
Head depth	Head depth/body depth	Hydrodynamics, manoeuvrability
Lower jaw length	Lower jaw length/head length	Range of prey items ingested
Anterior of orbit to forehead	Anterior of orbit/head length	Binocular vision
Horizontal eye position	Distance posterior the orbit/ head length	Field of perception
Vertical eye position	Distance ventral of orbit/head depth	Field of perception
Mouth-eye distance	Orbit centroid to premaxilla/head length	Eye-snout coordination
Mouth position	Ventral of snout/head depth	Prey acquisition
Longest dorsal spine	Longest dorsal spine/body depth	Predator avoidance, manoeuvrability
Snout angle	Angle characterizing tip of snout	Prey acquisition
Head angle	Angle characterizing anterior cranial region	Prey acquisition
Snout-eye angle	Angle between snout and eye	Eye-snout coordination

ESM 1: (b) List of categories of dietary items found in alimentary tracts of the examined species.

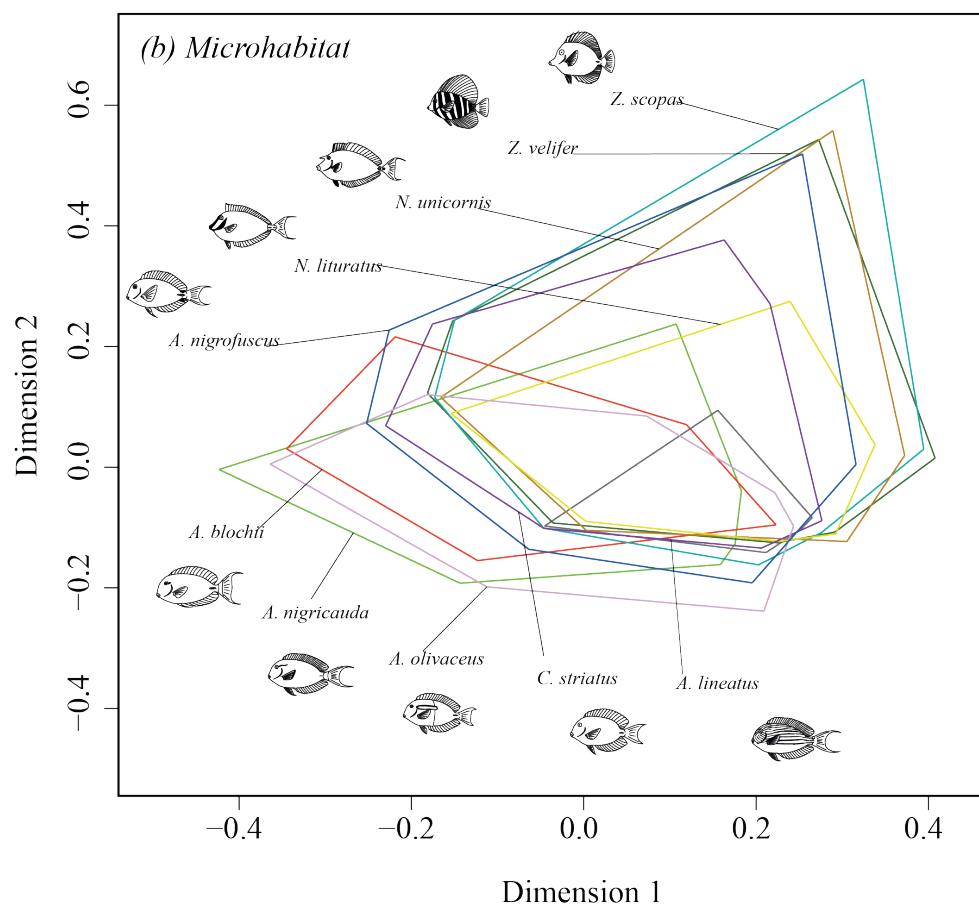
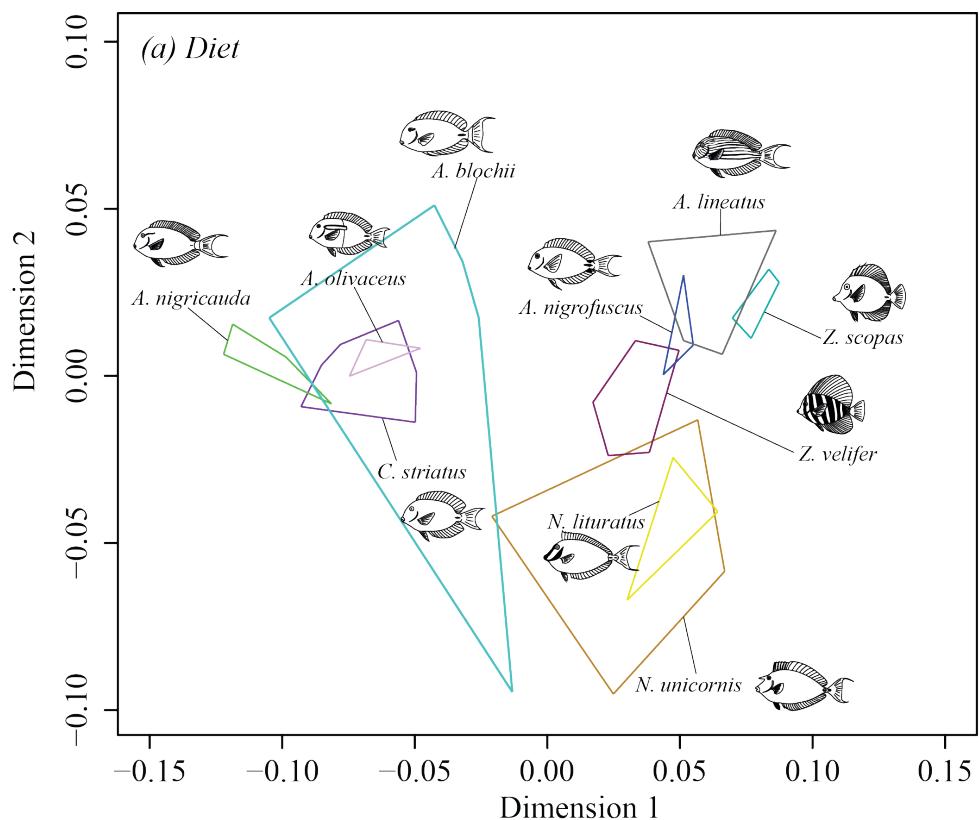
Brown filamentous algae
Brown foliose algae
Brown thallous algae
Gelatinous zooplankton
Green foliose algae
Green filamentous algae
Green thallous algae
Hydroids
Organic matter
Red filamentous algae
Red foliose algae
Red thallous algae
Calcareous sediment
Chitinous matter
Chitons
Crustacea
Echinoids
Eggs
Fish scales
Foraminifera
Gastropoda
Spicule
Arthropoda
Sponge spicule
Stomatopoda
Silaceous material
Heteropod mollusca
Sponges
Gelatinous matter



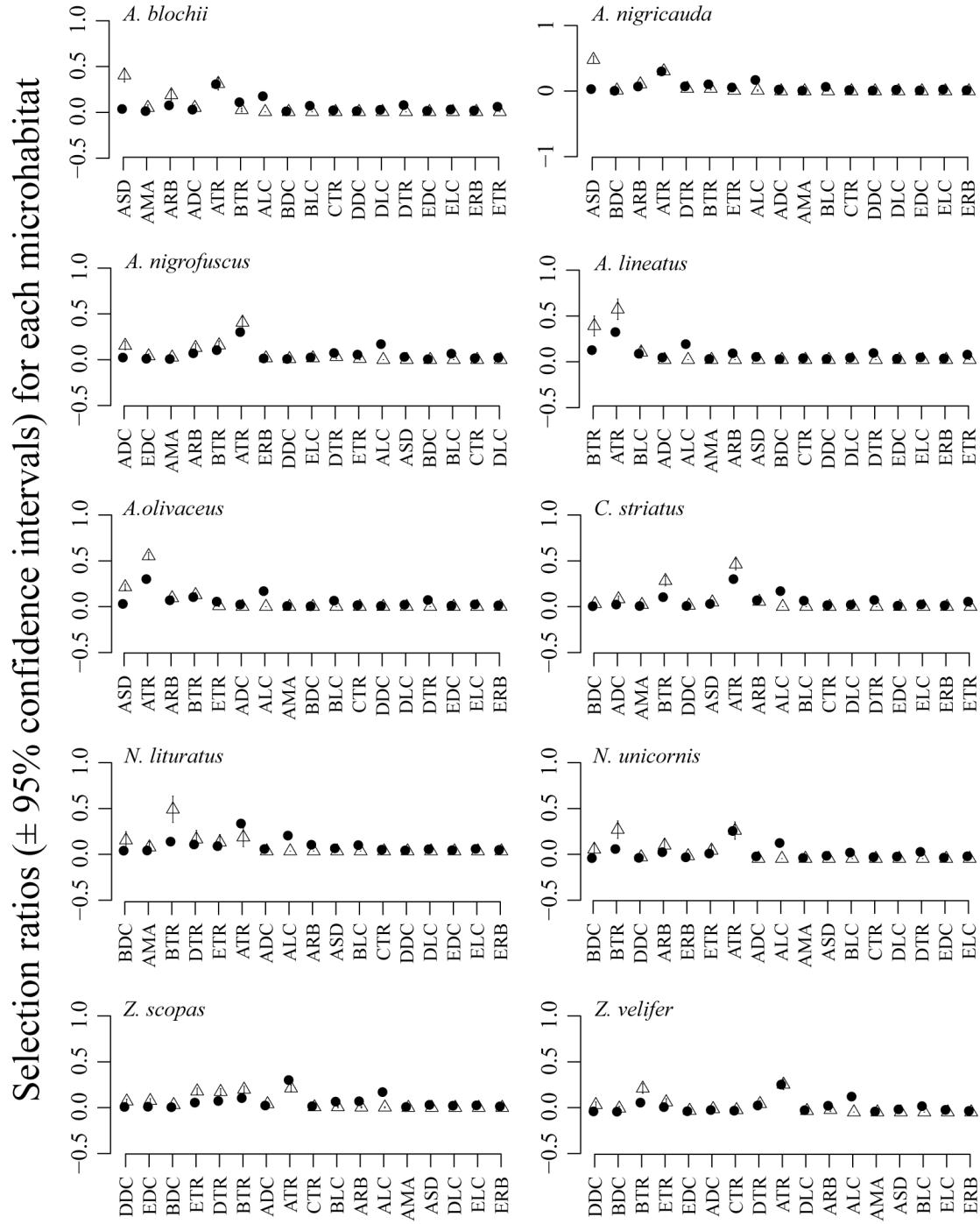
ESM 2: Pruned phylogenetic tree after Sorensen et al. 2013, which was used for all phylogenetic corrections.



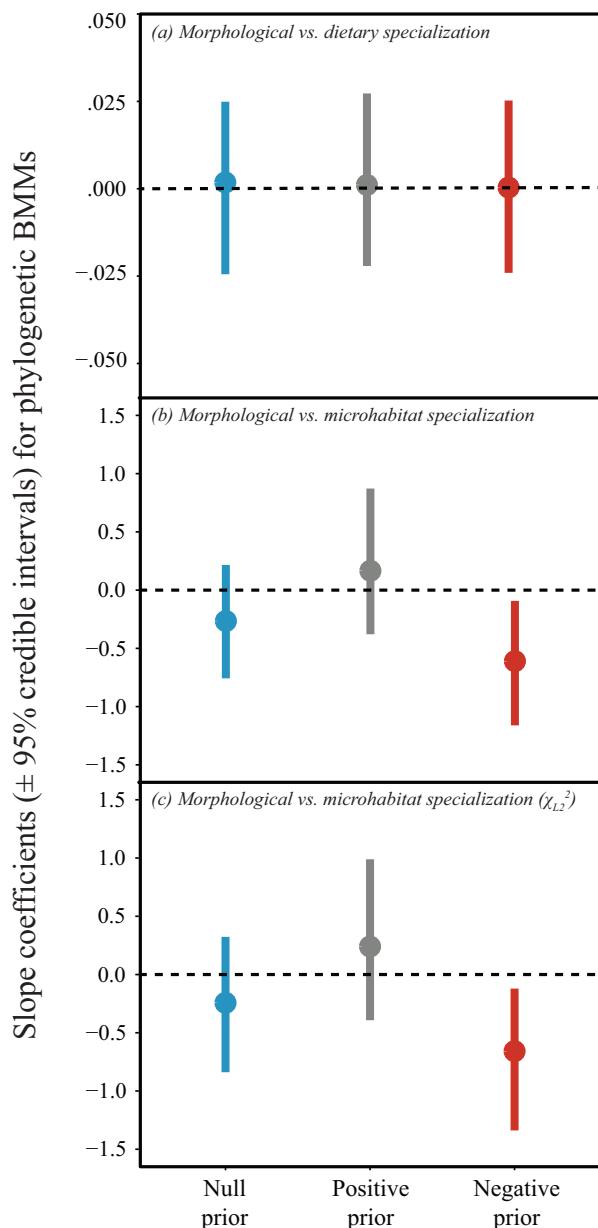
ESM 3: (a) Morphological ordination from which species-level morphological specialization was inferred by calculating the distance from the centroid of the ordination.



ESM 3: Niche volumes for ten species of surgeonfishes in two-dimensional niche space for (b) diet and (c) foraging microhabitat utilization.



ESM 4: Resource selection ratios for respective microhabitats in ten species of surgeonfishes. Open triangles are the usage, while filled circles mark the availability of the respective microhabitat. Acronyms consist of the surface orientation (A,B,C,D,E) and the given substratum type (DC, TR, RB, LC, MA, SD).



ESM 5: Results of the sensitivity analysis. The plot shows the mean posterior estimates of phylogenetic Bayesian Mixed Models (BMMs) testing the effect of morphological specialization on dietary and foraging microhabitat specialization (niche volumes and Manly's χ^2 log-likelihood statistic). The y-axis denotes the mean posterior estimate for the slope parameter. Three different priors were used to simulate prior beliefs about the relationship between morphological and behavioural specialization, specifically a) no relationship ("null prior"), b) a positive relationship (i.e. morphological specialists are behavioural specialists, "positive prior"), and c) a negative relationship (i.e. morphological specialists are behavioural generalists, "negative prior"). For both metrics of foraging microhabitat specialization, only the negative prior yielded an unambiguous negative relationship. No effect was found for dietary specialization regardless of the used prior.

Relationship modeled	Direction	Fixed effects prior: intercept (α)	Fixed effects prior: slope (β)	Mean posterior slope estimate	Lower/upper 95% CIs
Morphology vs. dietary niche volume	(0)	$Pr(\mu) \sim N(0, 0.2)$	$Pr(\mu) \sim N(0, 0.2)$	0.002	-0.03 / 0.03
	(+)	$Pr(\mu) \sim N(0, 0.2)$	$Pr(\mu) \sim N(1, 0.2)$	0.001	-0.02 / 0.03
	(-)	$Pr(\mu) \sim N(1, 0.2)$	$Pr(\mu) \sim N(-1, 0.2)$	0.0004	-0.02 / 0.03
Morphology vs. microhabitat niche volume	(0)	$Pr(\mu) \sim N(0, 0.2)$	$Pr(\mu) \sim N(0, 0.2)$	-0.265	-0.76 / 0.22
	(+)	$Pr(\mu) \sim N(0, 0.2)$	$Pr(\mu) \sim N(1, 0.2)$	0.166	-0.38 / 0.87
	(-)	$Pr(\mu) \sim N(1, 0.2)$	$Pr(\mu) \sim N(-1, 0.2)$	-0.610	-1.16 / -0.09
Morphology vs. microhabitat selectivity ($\chi_{L^2}^2$)	(0)	$Pr(\mu) \sim N(0, 0.2)$	$Pr(\mu) \sim N(0, 0.2)$	-0.243	-0.84 / 0.32
	(+)	$Pr(\mu) \sim N(0, 0.2)$	$Pr(\mu) \sim N(1, 0.2)$	0.241	-0.39 / 0.99
	(-)	$Pr(\mu) \sim N(1, 0.2)$	$Pr(\mu) \sim N(-1, 0.2)$	-0.658	-1.34 / 0.12